International Capital Movements, Flexible Exchange Rates and the IS-LM Model. A Comparison Between the Portfolio-Balance and the Flow Hypotheses

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International Capital Movements, Flexible Exchange Rates, and the IS-LM Model: A Comparison Between the Portfolio-Balance and the Flow Hypotheses

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In the Keynesian models of open economies it is usually assumed that, given the market rates of interest in the rest of the world, the *flow* of net capital imports is an increasing function of the domestic rate of interest[1]. Thus, to put it another way, the *speed* with which wealth owners adjust the structure of their portfolio of internationally traded bonds is considered to be dependent on this rate. The portfolio structure itself it indeterminate. In contrast, the portfolio-balance approach to exchange-rate determination assumes that, rather than the speed of adjustment (which is assumed to be infinite), the portfolio structure is determined by the domestic interest rate[2].

The present paper integrates the portfolio-balance approach into a simple IS-LM framework for a small open economy under flexible exchange rates and compares its implications with those of the flow hypothesis. Essential features of the model are that both the Keynesian IS-LM equilibrium and the international portfolio equilibrium are reached instantaneously and that dynamics arise from a gradual process of portfolio restructuring through trade imbalances. Since, by its Keynesian nature, the model is concerned with underemployment situations, it

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Remark: I gratefully acknowledge comments by Murray C. Kemp, J. Clark Leith, and Karlhans Sauernheimer. Remaining shortcomings are entirely mine.

[1] The assumption dates back to Fleming [1962] and Mundell [1962], and has been used, e.g., by Sohmen [1967] and Takayama [1969].

[2] See Girton and Henderson [1977], Branson [1976; 1977], and Kouri [1976]. For the related development of the monetary approach cf. Dornbusch [1976a; 1976b; 1980], Dornbusch and Krugman [1976] and various articles in Putnam and Wilford [1978]. A review of the asset-approach literature incorporating both the portfolio-balance and the monetary approach is given by Murphy and Van Duyne [1980]. According to these authors the key difference between the monetary and the portfolio-balance approach is that the former assumes perfect asset substitutability while the latter does not.

allows us to address traditional questions about fiscal and monetary policy and also to consider the possibility of an international transmission of employment changes. Whereas answers to these questions under the flow hypothesis are well known, little effort has been made so far to derive the corresponding answers from the viewpoint of the portfolio-balance approach[1]. It will be shown that some of the implications of this approach do not even approximate what for a long time has been the folklore of the profession.

I. A Framework for a Comparison

For the comparison the following world scenario is assumed. There is a large number of countries which are symmetric in all respects. The countries are perfectly specialized in the production of specific commodities and participate in commodity trade. Each country has two specific assets, money and an interest-bearing bond, the market price of which is fixed in terms of that country's currency. The bonds have been issued by private investors and by the government.

Within each country there are two types of residents: "normal residents" and "multinational wealth owners". The normal residents of a country are engaged in production, consumption, investment, and international commodity trade. In principle they want to hold their wealth in form of the domestic interest-bearing bond, but in order to manage the transactions involved in domestic production they also hold domestic money. The multinational wealth owners instead are solely occupied with managing a well-diversified "multinational portfolio", i.e., a portfolio of all interest-bearing assets existing in the world[2]. Because of the high

[1] A portfolio approach analysing the dynamics arising from Keynesian *disequilibrium* situations with divergences between actual and planned investment is provided by Levin [1980]. But Levin does not reach the basic conclusions of this paper and abstracts from the simple and undeniable fact that an exchange rate adjustment changes the value of domestic relative to foreign bonds in the portfolio of wealth holders. This fact, however, plays a crucial role in the determination of the exchange rate.

[2] The present approach is similar to that of Branson [1977], but the assumptions of perfect symmetry and two classes of agents mark significant differences. In Branson's model there is only one type of resident in each country, and, while domestic residents are allowed to hold foreign *and* domestic assets, foreign residents are only allowed to hold foreign assets. As soon as this asymmetry is removed, while the assumption of one type of agent is maintained, substantial difficulties may arise. Suppose, for example, domestic and foreign wealth owners have the same portfolio preferences in the sense that, given the pattern of interest rates and exchange rates, everyone chooses the same relative structure of his portfolio. Then an international redistribution of wealth effected through trade imbalances would not change the world-wide pattern of asset demands and would hence — contrary to Branson and contrary to the present model — leave all exchange rates unaffected. This implication would violate the stability requirement that the currency of a country appreciate when its trade balance is

velocity of portfolio transactions their stock demand for cash is negligible[1].

We focus on a particular country, the domestic country, where resources are underemployed and the price level of production is constant in terms of domestic currency. The country is small in the sense that nothing that happens in this country can affect producer prices, interest rates, production levels, and the mutual exchange rates in the rest of the world.

As suggested by Foley [1975] the model is specified in continuous time. This allows for a clear distinction between stocks and flows, and prevents us from running into the type of inconsistencies pointed out (and encountered[2]) by Kuska [1978].

The connection between the domestic country and the rest of the world is reflected by the balance-of-payments identity. It is assumed that for each point in time this identity can be written as[3]

$$(1) \qquad B + \dot{A} \equiv 0 \qquad \text{(f, pb)}$$

B is the instantaneous domestic currency trade balance which is the difference between commodity exports and imports, and $\dot{A}$ is the time derivative of A, where A denotes the stock of domestic bonds which the multinational wealth owners from all countries (including the domestic country) possess; A is evaluated in terms of domestic currency.

The basic assumption underlying the formulation (1) is that particular effects which are due to the interest income of multinational wealth owners can be disregarded. So the trade balance does not reflect the international

positive. In order to ensure stability, some kind of mechanism must be available which guarantees that a positive trade balance of a particular country leads to an increase in the world-wide demand for this country's assets. One possibility is Branson's asymmetry assumption. Another possibility, compatible with perfect symmetry, is the assumption of a separate class of multinational wealth owners as spelled out above. In the light of the high entrance costs to successful international portfolio management, this assumption does not seem to be too bad an idealization of reality.

[1] We exclude the possibility of a particular portfolio demand for cash. Note that Tobin's well-known explanation does not hold if, for each kind of money, there exists an interest-bearing bond, the risk of which is perfectly correlated with the risk of money, a condition which is rather likely to be met in reality. See Stiglitz [1969], Shell [1972], and the corresponding empirical investigations by Goldfeld [1973]. An extensive discussion of the problem can be found in Nachtkamp and Sinn [1981, pp. 283—286].

[2] See the various comments on Kuska's paper published in *The American Economic Review*, Vol. 71, 1981, pp. 774—795.

[3] To facilitate reading the paper we indicate by the symbols f and pb, respectively, whether a mathematical expression is used for analysing the flow or the portfolio-balance version of the model.

redistribution of interest flows. Furthermore, there is no change in the size of the multinational portfolio due to savings on the part of multinational wealth owners. This ensures that capital exports and imports arise only from a process of restructuring the multinational portfolio[1]. For example, a capital export of necessity means that multinational wealth owners sell some of their domestic assets to normal domestic residents, exchange the domestic money they receive for foreign currencies, and with these currencies buy foreign bonds from normal foreign residents. Formally, the neglect of interest income accruing to multinational wealth owners is legitimized with the assumption that they use the interest income earned in a particular country in exactly the same way as the normal residents of that country do. Accordingly, interest income is treated as if it accrued to these residents themselves. Of course, this assumption cannot be defended on any realistic grounds. But it is a convenient simplification[2] which, implicitly, has also been used in the standard Keynesian literature on foreign exchange with capital movements. If we were to drop it, a straightforward comparison between the findings of this literature and the implications of the portfolio-balance approach would be difficult. The differences found could then well arise from putting something into the model, which, up till then, had been treated as negligible, rather than from a fundamental change in the model specification.

The fundamental change in the model specification is substantiated in the way the foreign exchange equilibrium is achieved. According to the traditional flow hypothesis of capital movements at each point in time we have[3]:

$$\underset{(+)}{\dot{A}}(i) + \underset{(+)\ (-)\ (+)}{B}(Y^*, Y, r) = 0 \qquad (f)$$

Different from equation (1), this is an equilibrium condition where $\dot{A}(.)$ and $B(.,.,.)$ are behavioral functions. The variable i denotes the do-

[1] Sometimes capital flows are assumed to reflect the international allocation of savings rather than a process of restructuring given portfolios. It is, however, hard to believe that the international allocation of savings is able to explain a large share of capital movements. Anyway, our assumption at least fits the view expressed in the article by Sohmen [1967, p. 517] who admits that the flow hypothesis "has its serious drawbacks since it fails to take account of the nature of internationally mobile capital as a stock rather than a flow per unit of time" and who uses this hypothesis only "to escape prohibitive complications".

[2] It also simplifies the consumption function, since it prevents us from including the net interest inflow into the domestic country in the list of arguments (cf. equation (5)).

[3] Unless characterized by the term "long run" all equilibrium conditions occurring in the model are assumed to be met instantaneously. — Throughout the paper the signs given underneath the arguments of a function indicate the corresponding partial derivatives.

mestic rate of interest, Y* is an indicator of the production or employment level in the rest of the world, Y denotes domestic production or income, and r is the exchange rate (price of a foreign numéraire currency in terms of the domestic currency). With $B_r > 0$ it is assumed that the Marshall-Lerner condition is valid.

As an alternative to $\dot{A}(i)$ with $\dot{A}_i > 0$, the portfolio-balance approach offers a behavioral function of the type A(i, r) with $A_i, A_r > 0$, explaining the stock demand for domestic bonds on the part of multinational wealth owners. A reason for $A_r > 0$ is that an increase in the exchange rate reduces the value of domestic bonds relative to the value of foreign bonds in the multinational portfolio, so that the maintenance of a given portfolio structure in value terms requires the replacement of foreign by domestic bonds[1]. For an expositional simplification the special version, $r\,A^*(i)$, $rA_i^* > 0$, of the stock demand function will be used in this paper, where $A^*(.)$ is the stock demand in terms of the foreign numéraire currency. This version is appropriate if the share of domestic bonds in the multinational portfolio is small for all relevant values of i and r, a condition which is likely to be met if there is a large number of bonds available, as we assumed earlier[2]. However, little would alter in the model if the more general version were used.

With the stock demand function, as an alternative to equation (2), the equilibrium condition for the foreign exchange market can be written as:

$$(3) \qquad A = r\,A^*\underset{(+)}{(i)} \qquad (pb)$$

According to this condition, an equilibrium is achieved if the exchange rate is such that the stock of domestic bonds which multinational wealth

[1] Another reason for $A_r > 0$ is that, with stable expectations about the future exchange rate, an increase in the present exchange rate implies expected capital gains on domestic bonds or losses on foreign bonds, depending on which currency the portfolio holders consider as their numéraire. I do not stress this speculative motive since it is not incorporated in the flow version $\dot{A}(i)$ which is used for the comparison.

[2] The formulation does not anticipate which currency wealth owners choose as their numéraire. Neither does it imply that all choose the same numéraire. This becomes obvious by considering two alternative explanations for why A* is independent of r: (i) For a person calculating in terms of a foreign currency, a change in r practically has no influence on wealth and thus he wants to hold a given stock of value in the form of domestic bonds; (ii) For a person calculating in terms of domestic currency, a change in r affects wealth approximately in direct proportion, provided also that for him the share of domestic bonds in the portfolio is small. Under usual assumptions about portfolio choice (e.g., expected utility maximization under constant relative risk aversion) this implies that the desired stock of domestic assets also changes proportionately to r, or, in other words, that the desired foreign-currency value of this stock is independent of r.

owners want to hold (r A*(i)) equals the stock they actually possess (A). A striking difference from the flow equilibrium condition is that the trade balance does not appear any more. We shall see why.

II. A Partial Analytic Comparison

Suppose, for a first comparison between the flow hypothesis (2) and the portfolio-balance hypothesis (3), that, while i, Y*, and Y are exogenous parameters, i is parametrically brought up to a higher level. Then, according to both hypotheses, multinational wealth owners try to restructure their portfolios in favor of domestic bonds. For this purpose they have to sell foreign bonds to normal foreign residents, to exchange the foreign currency they receive for domestic currency, and to buy domestic bonds from normal domestic residents. Under either hypothesis the additional demand for domestic currency leads to a revaluation, i.e., to a decrease in r, which in turn induces an additional flow supply via an increase in the trade balance deficit (or a reduction in the surplus). So far, there is no difference between the rival hypotheses. But this is not the end of the process.

Under the traditional hypothesis the additional demand for domestic currency can easily be balanced by the increase in the trade balance deficit if the revaluation is sufficiently strong. The new equilibrium level of r is implicitly determined by equation (2). It is reached instantaneously and will be maintained until, in some remote future time, either the stock of domestic bonds in the hands of normal domestic residents or the stock of foreign assets in the multinational portfolio is exhausted.

Under the portfolio-balance hypothesis, satisfying the additional demand for domestic currency is not possible in an analogous way. In order to see the difference clearly, it is useful to distinguish between an instantaneous equilibrium and the dynamics of the system.

1. Instantaneous Equilibrium

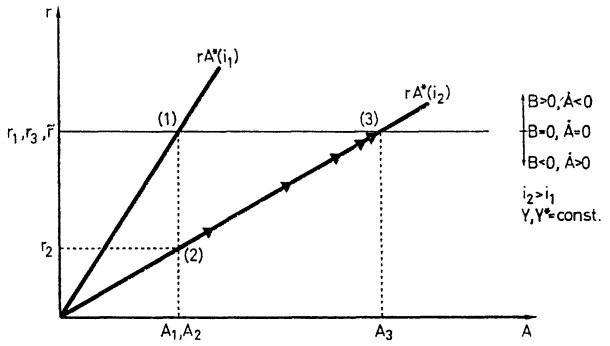
The crucial point is that the demand for domestic currency on the part of multinational wealth holders is now a stock and not a flow demand. Thus, at a given point in time, the increase in the trade-balance deficit induced by the revaluation of the domestic currency cannot even partially satisfy this demand[1]. This does not mean that an equilibrium cannot be

[1] The reader might think it strange to suppose that, at a given point in time, we can observe a normal reaction of the trade balance to an exchange rate movement. Indeed, there are strong reasons why in the short run there will be an adverse reaction. We would, however, leave the usual model framework by abolishing the assumption. Furthermore, the nature

reached instantaneously. Indeed it will be reached although for another reason. The revaluation raises the value of domestic assets relative to the value of foreign assets and changes thereby the structure of the multinational portfolio in the direction in which multinational wealth owners want it to be changed, without increasing the actual number of domestic bonds in the portfolio. Thus, an equilibrium will be achieved where r has fallen sufficiently to keep r A*(.) at the level of A although A*(.) has risen. This is expressed by equation (3). At any higher level of r the excess demand for domestic currency would not yet have been wiped out and at any lower level there would be an excess supply since multinational wealth holders would try to decrease the stock of domestic bonds which they possess[1].

Figure 1 gives a graphic illustration. For all variables the subscript "1" refers to the initial situation, "2" to the situation immediately after a parameter change and "3" to a long-run equilibrium that will be considered below. The rays through the origin represent the asset demand curves of multinational portfolio holders. A parametric increase in the rate of interest from i_1 to i_2 induces a shift from the upper to the lower demand curve. Given the stock of domestic assets in the multinational portfolio, A_1, the equilibrium point jumps from position (1) to position (2) and accordingly the exchange rate falls from r_1 to r_2, indicating a revaluation (of the domestic currency).

Figure 1



of the short-run equilibrium under the portfolio-balance hypothesis would be unaffected. Only the dynamic process described below would change since, for some initial period, the movement of the exchange rate would be reversed.

[1] In terms of flows, excess demand or excess supply are respectively infinite if the exchange rate deviates from its equilibrium value A/A*(i). Accordingly, each finite level of flow demand or supply in the exchange market is satisfied by multinational portfolio holders without (instantaneous) movement in the exchange rate.

2. Dynamics

Although the trade balance does not have any immediate influence on the exchange rate, it affects the dynamics of the system. In Figure 1 it is assumed that the exchange rate initially was on the level $r_1 = \tilde{r}$, where $\tilde{r}$ is defined such that the trade balance is zero for given Y and Y*. Obviously, $B < 0$ if $r < \tilde{r}$, and from the balance-of-payments identity (equation (1)) it is known that

$$\dot{A} = -B \underset{(+)}{(Y^*,} \underset{(-)}{Y,} \underset{(+)}{r}) \qquad (4) \qquad \text{(f, pb)}$$

Thus, at point (2) or generally for $r < \tilde{r}$, $\dot{A} > 0$. The additional flow supply of domestic currency from the trade-balance deficit is absorbed by multinational wealth owners and used to buy domestic bonds from normal domestic residents. With the passage of time, the stock of domestic bonds in the multinational portfolio gradually increases.

With a given exchange rate the wealth owners clearly would not be willing to finance a persistent deficit. Hence, to produce appropriate incentives for a continuing process of restructuring the portfolio, it is necessary that the exchange rate be gradually rising, provided that, as is assumed, the domestic rate of interest is kept constant at its higher level. In Figure 1 the adjustment process is illustrated by a movement along the lower asset demand curve from point (2) towards point (3). At any point in time after the initial parameter change, an instantaneous equilibrium of the same type as at point (2) prevails, except with higher values of r and A.

The process slows down as time goes by, since as $r \to \tilde{r}$ we have $-B = \dot{A} \to 0$. The new long-run equilibrium of the system[1] is described by point (3) in Figure 1, where the exchange rate equals its initial value,

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[1] The term "long-run equilibrium" is meant here in a very limited sense only. It simply indicates that capital flows from restructuring the multinational portfolio have ceased, a situation which, for all practical purposes, might arise within as short a time as a few years. The long-run equilibrium is not necessarily a situation where capital formation itself has stopped. Capital formation may occur permanently in the present model, but, since we assumed that the interest income of multinational wealth owners can be treated as if it accrued to normal domestic residents, capital formation does not change the size of the multinational portfolio and thus leaves the exchange rate unaffected (cf. footnote 1, p. 39). Together with all the Keynesian features that will be introduced below, this simplification should be abolished for a true long-run perspective or for an analysis that concentrates on the allocative aspects of international trade. (See, e.g., Genberg and Kierzkowski [1979], a model which, incidentally, is subject to the same criticism as that raised against Branson in footnote 2, p. 37.) However, for the type of policy matters studied in the present paper and the corresponding time perspectives the model specification chosen here seems to be appropriate.

$r_3 = r_1$, but the stock of domestic bonds in the multinational portfolio has risen to A_3, $A_3 > A_2$.

III. The Two Alternative Specifications in the IS-LM Model

So far the flow and the portfolio-balance hypotheses have been compared under the assumption that the domestic rate of interest, i, and domestic production, Y, are exogenous. Now we continue the comparison by adding equilibrium conditions for the commodity and asset markets, so that both parameters become endogenous (cf. footnote 3, p. 39).

We assume the usual IS equation:

$$(5) \qquad Y = C\underset{(+)}{(Y - T)} + I\underset{(-)}{(i)} + G + B\underset{(+)\ (-)\ (+)}{(Y^*, Y, r)} \qquad \text{(f, pb)}$$

where $0 < c - m < 1$, $c \equiv C_Y$ (marginal propensity to consume), and $m \equiv -B_Y$ (marginal propensity to import).

Here C(.) denotes consumption demand, T government taxes including net interest payments to the government, I(.) investment demand, and G government expenditure. For the sake of simplicity only, this formulation abstracts from terms-of-trade effects and imported investments. A more realistic model would definitely require these abstractions to be abolished. But we want to keep the model as traditional as possible except for the way capital movements are introduced.

We also maintain the simple LM equation

$$(6) \qquad \bar{L} = L\underset{(+)\ (-)}{(Y, i)} \qquad \text{(f, pb)}$$

implying

$$(7) \qquad di/dY\,|_{LM} = -L_Y/L_i > 0 \qquad \text{(f, pb)}$$

$\bar{L}$ is the stock of money balances and L (.,.) transactions demand for money. We treat $\bar{L}$ as an exogenously determined variable, assuming that monetary authorities do not intervene in the foreign exchange market and that an imbalance in the government budget is counterbalanced by the issuing or purchasing of domestic bonds. As usual the LM equation automatically ensures an equilibrium in the domestic bonds market: if normal domestic residents think that the money they hold is what they want to hold, they are, given their wealth, also willing to hold the bonds they actually possess. The fact that the wealth of the domestic residents is not an argument of the money demand function prevents us from considering dynamics due to the savings, $G - T + I + B$, on the part of normal domestic residents. Given i and Y, the residents

are willing to put all their savings into purchases of the additional domestic bonds being offered by the government (G—T), investors (I), and multinational wealth owners (B). To introduce a portfolio motive into the demand function would definitely add complications, but it is much less clear whether it would also add some realism (cf. footnote 1, p. 38).

Equations (2), (5), and (6) define the conventional Keynesian model of a small open economy. For the purposes of the discussion below this model is represented by the two curves in Figure 2.1. The upward sloping curve is the LM curve as described by equation (6). The other curve, call it CFF curve[1], represents possible equilibria in both the commodity and the foreign exchange markets. It is described by the equation

$$(8) \qquad Y = C\underset{(+)}{(Y - T)} + I\underset{(-)}{(i)} + G - \dot{A}\underset{(+)}{(i)} \qquad (f)$$

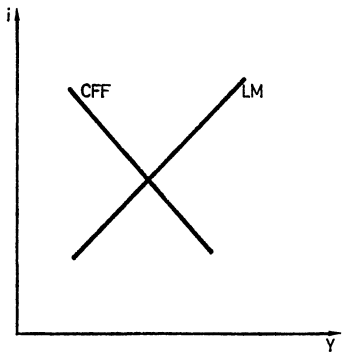
which is a combination of the equations (2) and (5). Its slope is

$$(9) \qquad di/dY\,|_{CFF} = (1 - c)/(I_i - \dot{A}_i) < 0 \qquad (f)$$

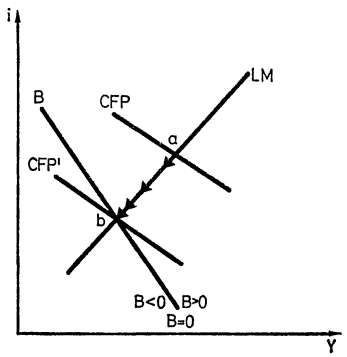
The solution for i and Y of the model is given by the intersection of the two curves.

Figure 2

2.1 — *Flow Hypothesis*



2.2 — *Portfolio-Balance Hypothesis*



A Keynesian model incorporating the portfolio-balance hypothesis is provided by equations (3)—(6). A graphic illustration of this model is given in Figure 2.2. The upward-sloping curve is again the LM curve as defined by equation (6). The other curves are explained in the following paragraphs.

[1] CFF means *c*ommodity market, *f*oreign exchange market, *f*low hypothesis.

1. Instantaneous Equilibrium

According to equation (3), an instantaneous equilibrium in the foreign exchange market implies that the exchange rate is $r = A/A^*(i)$. So, given the stock of domestic assets in the multinational portfolio, A, the exchange rate is inversely related to the domestic rate of interest. The integration of this relationship into the IS equation (5) yields

$$(10) \quad Y = \underset{(+)}{C}(Y-T) + \underset{(-)}{I}(i) + G + \underset{(+)\ (-)\ (+)\ (+)}{B}(Y^*, Y, A/A^*(i)) \qquad (pb)$$

This equation indicates possible short-run equilibria in the commodity and foreign exchange markets. For a particular value of A, equation (10) is graphically represented by the curve labelled CFP[1] in Figure 2.2. The slope of this curve is

$$(11) \quad di/dY\,|_{CFP} = [1 - c + m]/[I_i - B_r\,\eta_{A^*}\,r/i] < 0 \qquad (pb)$$

where $\eta_{A^*} \equiv A_i^*\,i/A^*$ denotes a substitution elasticity between domestic and foreign bonds. The point of intersection of the CFP curve and the LM curve indicates a situation where all markets are in an instantaneous equilibrium.

The position of the CFP curve depends crucially on the size of the stock of domestic assets in the multinational portfolio, A. Differentiating equation (10) implicitly for given Y we find

$$(12) \quad di/dA\,|_{Y,CFP} = -[B_r/A^*(i)]/[I_i - B_r\,\eta_{A^*}\,r/i] > 0 \qquad (pb)$$

Thus the CFP curve shifts upwards if A increases, and downwards if it falls.

2. Dynamics

Figure 2.2 also contains a curve labelled B. This curve is defined such that the expression for the trade balance in equation (10) is set equal to zero:

$$(13) \quad Y = \underset{(+)}{C}(Y-T) + \underset{(-)}{I}(i) + G \qquad (pb)$$

Its slope is

$$(14) \quad di/dY\,|_{B} = (1 - c)/I_i < 0 \qquad (pb)$$

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[1] CFP means *c*ommodity market, *f*oreign exchange market, *p*ortfolio-balance.

The B curve is the locus of balanced-trade equilibria. Whenever there is a short-run equilibrium above this curve, the trade balance is positive, and whenever there is an equilibrium below the curve, it is negative[1]. Moreover, if a movement occurs along the LM curve away from the point where the LM and the B curves intersect, the trade balance increases in absolute terms. These properties follow immediately by differentiating equation (10) for given values of T and G,

$$dY = c\,dY + I_i\,di + dB,$$

inserting equation (7), and rearranging terms:

$$(15) \quad dB/dY\,|_{CFP,\,LM} = 1 - c + I_i\,L_Y/L_i > 0 \qquad \text{(pb)}$$

Together with the CFP curve and the differential equation (4) the B curve provides important information about the dynamics of the system. Suppose, in Figure 2.2, the system is observed at a point in time where the short-run equilibrium is at point a. Then, since this point is above the B curve, we have $B = -\dot{A} > 0$, i.e., $\dot{A} < 0$. Thus, with the passage of time, the CFP curve as well as the intersection between this curve and the LM curve shift downward. The process continues for as long as the intersection point is above the B curve and comes to a halt if it coincides with point b where the B and the LM curves intersect. The latter is therefore the long-run equilibrium of the system. An analogous movement along the LM curve towards this point would be observable if we were to start with a CFP curve cutting the LM curve below the B curve.

There is a further piece of information on the adjustment process that is worth spelling out. If the short-run equilibrium point moves towards the long-run equilibrium point from below, then equation (15) implies $\dot{B} > 0$. If the movement is from above we have $\dot{B} < 0$. Since $\dot{A} = -B$ this gives rise to a surprising conclusion: Under the portfolio-balance hypothesis the process of dynamic adjustment towards long-run equilibrium is characterized by a relationship between capital movements and the domestic interest rate that is the reverse of the relationship postulated by the flow hypothesis. Either there are capital imports that are falling in time while the rate of interest is rising, or there are capital exports gradually declining while the rate of interest is also declining.

[1] Note that the B curve is *not* the locus of points where, given the exchange rate and given Y^*, the trade balance is zero. Such a curve, which frequently occurs in Keynesian international trade models would be vertical and to the right of it B would be negative while to the left of it B would be positive. Instead, the B curve is the locus of points compatible with both a commodity market equilibrium and a zero trade balance. On this curve the exchange rate is not a constant, but varies directly with the income level.

It is not difficult to provide the intuition for this peculiar result. Consider, e.g., the case of capital imports and a deficit in the trade balance. Here the exchange rate rises to induce a process of restructuring the multinational portfolio in favor of domestic bonds. The rise in the exchange rate reduces the trade-balance deficit. This reduction, in turn, has a twofold implication. On the one hand, the equilibrium flow of capital imports is falling. On the other, there is an expansion of domestic production which, because of a given LM curve, raises the rate of interest. Thus, the changes in the rate of interest and in the level of capital imports are both generated by the same mechanism, but there is no direct causal link between them as there is under the flow hypothesis.

In Figure 2.2 it was assumed that the curve CFP', which gives the long-run position of the CFP curve, is flatter than the B curve. This was an arbitrary assumption. It does not affect what we have been discussing so far, but in the next section we shall see that the question of how the slopes of the two curves are related is very important for further questions.

IV. Parameter Changes

We are now going to ask what the two competing models predict if alternatively the stock of money balances, the size of government expenditure or the foreign production level are changed. Either an increase or a decrease in the value of these parameters is discussed, since the results for the opposite changes are straightforward[1]. To facilitate the comparison it is assumed that the economy is initially in a situation without any capital movements, which under the portfolio-balance hypothesis characterizes a long-run equilibrium. In principle, three situations in which the economy is observed, are distinguished; the situation before the parameter change (1), the short-run equilibrium immediately after the change (2), and the new long-run equilibrium (3). For the flow model, however, we consider only the first two of these situations, assuming that the short-run equilibrium can persist for a while. To investigate the true long-run equilibrium of the flow model would be somewhat unfair.

1. Monetary Policy

Suppose we reduce the domestic stock of money balances. Then, since equation (6) implies

$$(16) \quad di/dL \,|_{Y,\,LM} = 1/L_i < 0, \qquad (f, pb)$$

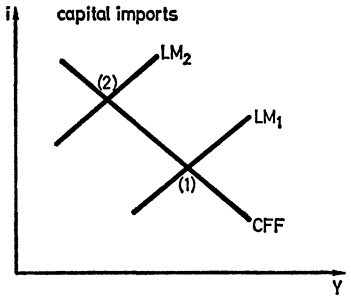
[1] The parameter changes are chosen such that, at least in one of the rival models, there is an increase in the rate of interest.

the LM curve shifts upwards. In Figure 3.1 and 3.2 this is illustrated by a shift from LM_1 to LM_2 or $LM_{2,3}$, respectively[1].

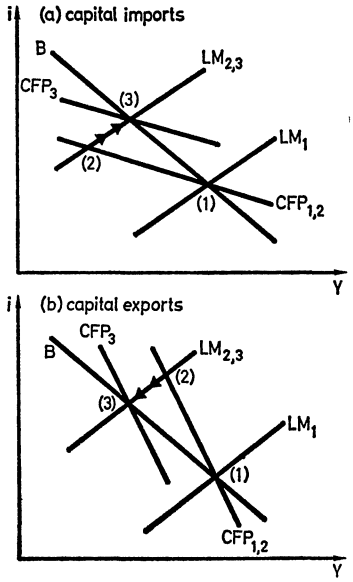
Since the CFF curve as given by equation (8) is not affected by a change in money supply, under the flow hypothesis the equilibrium point shifts from (1) to (2) in Figure 3.1. Thus, $Y_2 < Y_1$ and $i_2 > i_1$. In connection with $\dot{A} = \dot{A}(i), \dot{A}(i) + B(Y^*, Y, r) = 0$, and $Y^* = \text{const.}$ $\underset{(+)}{\phantom{\dot{A}(i)}}$ $\underset{(-)\,(+)}{}$ this also implies that $\dot{A}_2 > \dot{A}_1 = 0$ and $r_2 < r_1$. Thus capital imports start and the exchange rate drops sufficiently to produce the required deterioration in the trade balance, although the fall of domestic production would by itself lead to an improvement.

Figure 3

3.1 — *Flow Hypothesis*



3.2 — *Portfolio-Balance Hypothesis*



The short-run result under the portfolio-balance hypothesis is indicated by points (2) in Figures 3.2(a) and 3.2(b). Since the stock of domestic assets cannot change instantaneously, the upward shift of the LM curve leads to a new equilibrium point on the given CFP curve where $Y_2 < Y_1$ and $i_2 > i_1$. The new equilibrium will, however, generally be characterized

[1] The numerical subscripts to variables or curve names indicate the situations described in the introduction to Section IV.

by $B = -\dot{A} \neq 0$. So, with the passage of time the CFP curve has to move until it intersects the new LM curve at point (3) where the latter also intersects the given B curve. The long-run equilibrium is characterized by $Y_3 < Y_1$ and $i_3 > i_1$.

Both the long-run and the short-run results concerning the rate of interest and national product do not differ qualitatively from those under the flow hypothesis. Nevertheless, there are other aspects of the portfolio-balance model that indicate substantial differences from the flow model.

It is known from the previous section that, *after* the new short-run equilibrium has been reached, with the passage of time the rate of interest and the flow of capital change in a way that contradicts the flow hypothesis: i and $\dot{A}$ move in opposite directions. The question is, however, whether the stock-adjustment hypothesis coincides with its rival at least in predicting the same direction of capital movements, i.e., the same sign of $\dot{A}$. The answer depends on the slope of the CFP curve relative to that of the B curve. Figures 3.2(a) and 3.2(b) show the alternatives. If the CFP curve is the flatter of the two, then point (2) lies in the region where $B = -\dot{A} < 0$. Thus there are capital imports. The opposite is true if the CFP curve is steeper. In this case, capital movements are in absolutely no sense compatible with the flow hypothesis. Immediately after the reduction in the domestic money supply the rate of interest rises and capital exports start. Then, with the passage of time, both the rate of interest and the level of capital exports decline.

In order to examine the possibility of capital exports in somewhat more detail, we want to compare the slopes of the CFP and B curves as given by the equations (11) and (14). According to these, the condition for observing capital exports is

$$[1 - c + m]/[I_i - B_r \eta_{A^*} r/i] < (1 - c)/I_i$$

or, if we rearrange terms,

$$(17) \quad -m I_i i > B_r r \eta_{A^*} (1 - c) \qquad \text{(pb)}$$

To interpret this inequality, write the trade balance explicitly as

$$B(Y^*, Y, r) = X(Y^*, r) - r M^*(Y, r)$$

where $X(.,.)$ denotes exports in terms of domestic currency, and $M^*(.,.)$ denotes imports in terms of the foreign numéraire currency. This yields

$$r B_r = X_r \frac{r}{X} X - M_r^* \frac{r}{M^*} rM^* - rM^*$$

If we define[1]

$$\eta_{M^*} \equiv M_r^* \frac{r}{M^*} \text{ (price elasticity of import demand),}$$

$$\eta_X \equiv \frac{\partial X}{\partial (1/r)} \frac{1/r}{X} = - X_r \frac{r}{X} \text{ (price elasticity of export demand),}$$

$$M \equiv rM^* \text{ (imports in terms of domestic currency),}$$

and note that in the long-run equilibrium $B = X - M = 0$, we can also write this expression in a Marshall-Lerner version:

$$r B_r = (- \eta_X - \eta_{M^*} - 1) M$$

Define furthermore

$$\eta_I \equiv I_i \frac{i}{I} \text{ (interest elasticity of investment) and}$$

$$\eta_M \equiv m \frac{M}{Y} \text{ (income elasticity of imports).}$$

Then, inserting the last three expressions into equation (17), we find the following condition for observing capital exports after a decrease in the supply of money balances:

$$(18) \quad - [\eta_M \eta_I (I/Y)]/[1 - c] > (- \eta_X - \eta_{M^*} - 1) \eta_{A^*} \qquad \text{(pb)}$$

where by assumption $\eta_M, - \eta_I, I/Y, 1 - c, (- \eta_X - \eta_{M^*} - 1), \eta_{A^*} > 0$.

Condition (18) shows that the direction of capital movements depends on the net effect of two forces. The first one is represented by the right-hand side of this condition and was recognized already in the partial equilibrium analysis of Section II. An increase in the rate of interest causes the domestic currency to appreciate since wealth owners try to restructure their portfolio in favor of domestic bonds. By itself the revaluation causes the trade balance to deteriorate, thus creating capital imports. The effect is stronger the greater the extent to which wealth owners try to restructure their portfolio (η_{A^*}) and the greater the sensitivity of the trade balance to the revaluation ($\eta_X - \eta_{M^*} - 1$). The second effect is represented by the left-hand side of condition (18). The increase in the

[1] Note that X and M* are proportional to the underlying quantities since, by assumption, the domestic price level and producer prices in the rest of the world are exogenous.

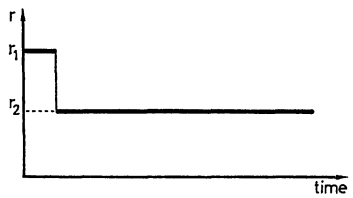
rate of interest reduces investment demand which, via the corresponding decline in domestic production, tends to improve the trade balance and thus to produce capital exports. The strength of this effect depends on how much investment reacts to a change in the interest rate (η_I), how important investment is (I/Y), how large the multiplier is (1/(1 — c)) and how responsive imports are to a change in income (η_M). Here is not the place to speculate about the numerical values of all these parameters. However, if there is still some truth in the "elasticity pessimism" in the weak sense that $|\eta_X| + |\eta_{M^*}|$ is only slightly above unity, it may well be the case that reducing the money supply leads to capital exports rather than capital imports.

The direction of capital movements is also important for the time paths of the other endogenous variables of the model. An inspection of Figure 3.2(a) and 3.2(b) completes the information gained above on the changes in production and in the rate of interest. If the contractive monetary policy creates capital imports as the flow hypothesis suggests, then it is less effective in the long run than in the short run: $Y_2 < Y_3 < Y_1$ and $i_1 < i_2 < i_3$. If, however, as frequently contended, monetary policy has its strength in long-run effects ($Y_3 < Y_2 < Y_1$ and $i_1 < i_3 < i_2$), then a contractive policy must create capital exports despite a rise in the domestic rate of interest.

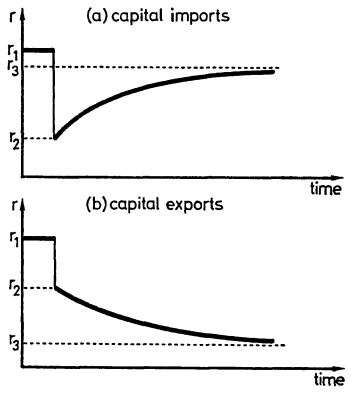
The possible time paths of the exchange rate are illustrated in Figures 4.2(a) and 4.2(b) for comparison with the time path under the flow hypothesis which is depicted in Figure 4.1. In both cases, as under the flow hypothesis, the short-run result is $r_2 < r_1$, since $r = A/A^*(i)$, with $A_i^* > 0$, and $i_2 > i_1$. But, after the point in time where the parameter change

Figure 4

4.1 — *Flow Hypothesis*



4.2 — *Portfolio-Balance Hypothesis*



occurs, we find substantial differences. In the case of capital imports (cf. Figures 3.2(a) and 4.2(a)), we have $0 = B_1 = B_3 > B_2$ and $Y_2 < Y_3 < Y_1$. Since $B = B(Y^*, Y, r)$, with $B_Y < 0$ and $B_r > 0$, and $Y^* = \text{const.}$ this implies $r_3 > r_2$, but $r_3 < r_1$. But if there are capital exports (cf. Figures 3.2(b) and 4.2(b)), we have $0 = B_3 < B_2$ and $Y_3 < Y_2$. This implies that $r_3 < r_2$ [1].

The general conclusion of this section may now be restated briefly as follows. Under both rival hypotheses a decrease in money supply reduces both the level of production and the exchange rate, and raises the rate of interest. While under the flow hypothesis capital imports start and all variables reach their new values immediately, the portfolio-balance hypothesis brings about two alternative possibilities for a dynamic adjustment process. Either there are capital imports, an undershooting in the rate of interest, and an overshooting in both the level of production and the exchange rate, or there are capital exports, an overshooting in the rate of interest, and an undershooting in both the exchange rate and domestic production. In the latter case, not only during the adjustment process towards the long-run equilibrium but also in the immediate reaction, the relationship between capital movements and the domestic rate of interest is precisely the reverse of what the flow hypothesis postulates. This case is likely to prevail if, with reference to absolute values, the multiplier, the share of investment in production, the interest elasticity of investment, and the income elasticity of imports are large relative to the price elasticity of export and import demand, and the elasticity of substitution between domestic and foreign bonds.

2. Fiscal Policy

We now come to a discussion of an increase in government expenditure, G. Obviously this parameter change does not affect the LM curve described by equation (6). But, as shown by Figures 5.1 and 5.2, the other curves representing the two competing models are all subject to shifts.

For the flow hypothesis it can be seen from equation (8) that the CFF curve shifts upwards:

$$(19) \quad di/dG \,|_{Y,\,CFF} = -1/(I_i - \dot{A}_i) > 0 \qquad (f)$$

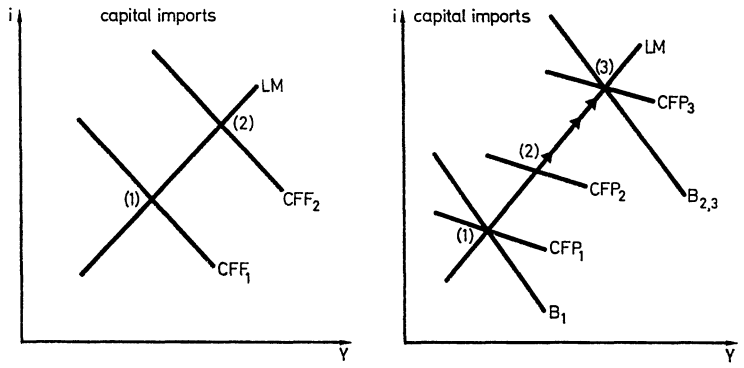
This moves the equilibrium point from (1) to (2) in Figure 5.1 which implies $Y_2 > Y_1$ and $i_2 > i_1$. Because of the rise in the rate of interest, capital imports start. The direction in which the exchange rate moves is,

[1] Similar time paths for the exchange rate are possible in a model of Niehans [1977]. There, however, the reason is a particular sluggishness of portfolio adjustments.

however, ambiguous since it is not clear how the sum $\dot{A}(i) + B(Y^*, Y, r)$ is affected by the parallel increase in i and Y which characterizes a movement along the LM curve. Obviously, since $B_r > 0$, a balance-of-payments equilibrium (compare equation (2)) requires $r_2 \left\{\begin{matrix}\geqq\\ \leqq\end{matrix}\right\} r_1$ if $\dot{A}_i \, di/dY \,|_{LM} \, dY - m dY \left\{\begin{matrix}\leqq\\ \geqq\end{matrix}\right\} 0$, i.e. if, according to equation (7), $- L_Y/L_i \left\{\begin{matrix}\leqq\\ \geqq\end{matrix}\right\} m/\dot{A}_i$.

Figure 5

5.1 — *Flow Hypothesis* 5.2 — *Portfolio-Balance Hypothesis*



From an inspection of equations (10) and (13), we find that under the portfolio-balance hypothesis the increase in government expenditure shifts both the CFP and the B curves upwards, such that in the short and in the long run other points on the LM curve are reached. To determine which of these points is higher, we differentiate these equations making use of $di/dY \,|_{LM} = - L_Y/L_i$. From equation (10) we obtain

$$dY = c \, dY - m \, dY + dG - \frac{L_Y}{L_i} \, dY \left(I_i - \frac{r}{i} \, B_r \, \eta_{A^*} \right)$$

or, by rearranging terms,

$$(20) \quad dY = dG \Big/ \left[1 - c + m + \frac{L_Y}{L_i} \left(I_i - \frac{r}{i} \, B_r \, \eta_{A^*} \right) \right] \equiv \alpha > 0 \qquad \text{(pb)}$$

Instead, equation (13) implies:

$$(21) \quad dY = dG \Big/ \left(1 - c + \frac{L_Y}{L_i} \, I_i \right) \equiv \beta > 0 \qquad \text{(pb)}$$

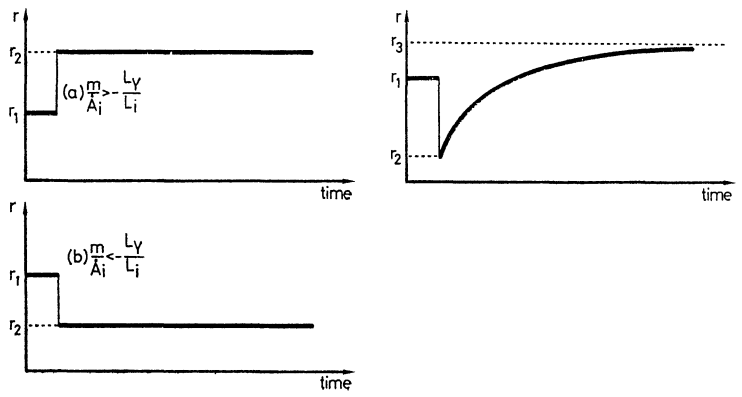
Since $m > 0$, $r B_r \eta_{A^*}/i > 0$ and $L_Y/L_i < 0$ it follows that $\alpha < \beta$. Thus, along the LM curve, the B curve shifts higher up than the CFP curve. This implies $Y_3 > Y_2 > Y_1$ and $i_3 > i_2 > i_1$. In both the long and the short run, domestic production and the rate of interest increase, but the long-run adjustment exceeds the short-run adjustment. Fiscal policy therefore brings about a significant crowding-in effect. An increase in government demand raises the level of production and creates a trade-balance deficit. To finance the deficit through capital imports a continuing depreciation is required. The depreciation reduces the deficit and thereby gradually raises domestic production. The result is illustrated in Figure 5.2. It is independent of whether or not the CFP curve is flatter than the B curve as assumed in this figure.

In contrast to the previous section we now find that capital movements under the portfolio-balance hypothesis unambiguously go the same direction as under the flow hypothesis. Since the short-run equilibrium point (2) is below the new B curve, the adjustment process towards the long-run equilibrium is characterized by capital imports. However, as always in such a situation, with the passage of time, capital imports decline while the rate of interest rises. This is, of course, not in line with the flow hypothesis.

A comparison of the exchange rate movements under the flow and the portfolio-balance hypotheses is given by Figure 6.1(a), 6.1(b), and 6.2. For the portfolio-balance hypothesis, we have $r_2 < r_1$ since $r = A/A^*(i)$, with $A_i^* > 0$, and $i_2 > i_1$. Furthermore $B_1 = B_3 = 0$, $Y_3 > Y_1$, $B = B(Y^*, Y, r)$, with $B_Y < 0$, $B_r > 0$, and $Y^* = \text{const.}$ imply $r_3 > r_1$.

Figure 6

6.1 — *Flow Hypothesis* 6.2 — *Portfolio-Balance Hypothesis*



The results shed a rather favorable light on the efficacy of fiscal policy in a system of flexible exchange rates. Hence they merit contrast with Mundell's famous proposition [1963] that fiscal policy is ineffective in the limiting case of perfect capital mobility.

If in the flow version of the model perfect mobility is interpreted in the sense $\dot{A}_i \to \infty$, Mundell's result can easily be derived from equations (9) and (19): obviously, the CFP curve in the limit becomes a horizontal line, the position of which cannot be affected by a change in government expenditure.

Under the portfolio-balance hypothesis there are two possible interpretations of "perfect mobility". If this term is taken literally, then Mundell's proposition fails to hold, since our results have been derived under the assumption of instantaneous portfolio adjustments, i.e., of an infinite speed of adjustment. Yet, Mundell defined perfect mobility as perfect substitutability between foreign and domestic bonds. Therefore it is useful to check what the model predicts for $\eta_{A^*} \to \infty$. From equations (11) and (20) we find that, like the CFF curve, the CFP curve approaches a horizontal line, the position of which is independent of the level of government expenditure. According to equation (21), however, independently of η_{A^*}, the B curve still shifts upwards if government expenditure is increased. Thus, at first glance, it seems that Mundell's proposition is correct in the short run, but false in the long run.

A more careful analysis, however, gives a different result. In connection with $Y_2 = Y_1$ and $i_2 = i_1$ condition (10) implies that the new short-run equilibrium is characterized by $\Delta B = -\Delta G$ where ΔG is the increase in government expenditure. Combining this piece of information with equations (4) and (12) it turns out that

$$\dot{A}\ di/dA\,|_{Y,CFP} = -\Delta G\,[B_r/A^*(i)]\Big/\left(I_i - B_r\,\frac{r}{i}\,\eta_{A^*}\right)$$

This equation ensures that the speed with which the CFP curve is moving upwards approaches zero as $\eta_{A^*} \to \infty$. Thus, in the limiting case analysed by Mundell the notion of a long-run equilibrium is meaningless.

To summarize this section we may state: The rival models unanimously predict that an increase in government expenditure creates capital imports and raises both domestic production and the interest rate. However, contrary to the one-step adjustment under the flow hypothesis, the portfolio-balance model implies an undershooting in the rate of interest and in the level of production. While the exchange rate reacts ambiguously under the flow hypothesis, under the portfolio-balance hypothesis it first

falls below, and then rises beyond, its initial level. In the limiting case of perfect substitutability between foreign and domestic bonds, the flow and the portfolio-balance models coincide, restating Mundell's proposition on the ineffectiveness of fiscal policy. But except for this case, in the long run, fiscal policy turns out to have the same impact on the level of economic activity as in the absence of capital movements (or as in a closed economy).

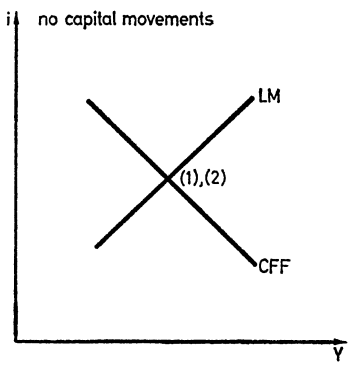
3. The International Transmission of Employment Changes

In this section we address ourselves to the question of whether or not flexible exchange rates insulate the domestic economy from a permanent world-wide increase in employment[1], Y*. As in the previous section an inspection of equation (6) immediately makes it clear that the position of the LM curve cannot change. Whether and how the other curves representing the models are affected is shown in Figures 7.1 and 7.2.

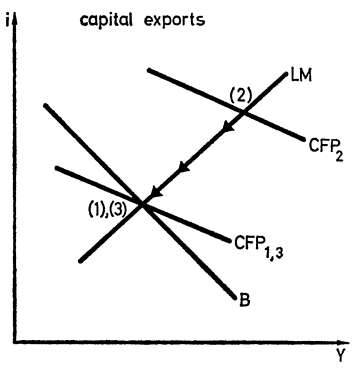
From equation (8) we find that the CFF curve drawn in Figure 7.1 maintains its position. Thus, under the flow hypothesis, we have $Y_2 = Y_1$ and $i_2 = i_1$, a perfect insulation. In addition, the constancy of the rate of interest ensures that capital imports cannot change either. With respect to $\dot{A}(i) + B(Y^*, Y, r) = 0$ — with $\dot{A}_i > 0$, $B_{Y^*} > 0$, $B_Y < 0$, $B_r > 0$ — and $Y_2^* > Y_1^*$, the latter in turn implies that $r_2 < r_1$.

Figure 7

7.1 — *Flow Hypothesis*



7.2 — *Portfolio-Balance Hypothesis*



[1] In order to concentrate on one channel of influence we do not allow for a change in the interest rates in the rest of the world. This implies that the increase in employment is accompanied by an appropriate increase in money supply by foreign monetary authorities.

For the portfolio-balance hypothesis we derive from equation (10) that

$$(22) \quad di/dY^*|_{Y,CFP} = -B_{Y^*}/\left(I_i - B_r \frac{r}{i} \eta_{A^*}\right) > 0 \qquad (pb)$$

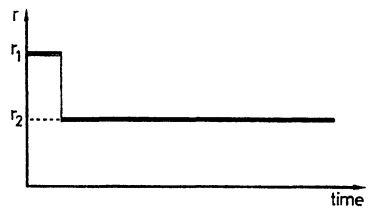
Thus, immediately after the parameter change, the CFP curve shifts upwards. This is illustrated in Figure 7.2 by a shift from CFP_1 to CFP_2. Accordingly, the equilibrium point moves from (1) to (2), such that $Y_2 > Y_1$ and $i_2 > i_1$. Since, however, equation (13) indicates that the B curve maintains its old position, we have $Y_3 = Y_1$ and $i_3 = i_1$. Hence, with the passage of time, domestic production and the rate of interest gradually have to return to their original levels. The permanent increase in world-wide employment stimulates domestic employment, but only temporarily.

In Figure 7.2 point (2) is above the B curve and also above the original equilibrium point (1). Thus, as in one of the two cases discussed in Section IV.1, capital movements are again absolutely incompatible with the flow hypothesis. On the one hand, we have $i_2 > i_1$ and $\dot{A}_2 < \dot{A}_1 = 0$; i. e., capital exports start when the rate of interest rises. (The result now occurs even independently of the relationship between the slopes of the CFP and B curves). On the other hand, during the adjustment process towards the long-run equilibrium, the rate of interest is gradually declining along with the volume of capital exports.

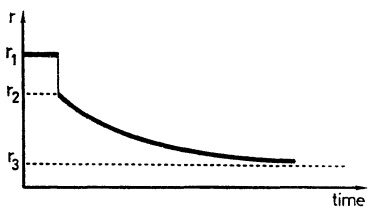
The comparison of the exchange rate movements under the two rival hypotheses is given in Figures 8.1 and 8.2. For the portfolio-balance hypothesis we know that $i_2 > i_1$. Because of $r = A/A^*(i)$, with $A_i^* > 0$, this implies $r_2 < r_1$. Furthermore, it is known that $0 = B_3 < B_2$, $Y_2^* = Y_3^*$, $Y_3 < Y_2$, and $B = B(Y^*, Y, r)$, with $B_{Y^*} > 0$, $B_Y < 0$, $B_r > 0$. Thus, obviously, $r_3 < r_2$.

Figure 8

8.1 — *Flow Hypothesis*



8.2 — *Portfolio-Balance Hypothesis*



A comparison of the two rival hypotheses under the assumption of an exogenous increase in export demand again shows very substantial

differences. If the flow hypothesis of capital imports is valid, then the international increase in employment cannot be transmitted into the domestic country via the trade balance. For any given rate of interest, capital imports are well determined and so the exchange rate has to adjust until the effect of the exogenous increase in exports on the trade balance is completely neutralized. The only possibility of spill-over effects under the flow hypothesis is that the exchange rate adjustment itself affects economic variables via terms-of-trade effects. But we have disregarded this possibility. If, instead, the portfolio-balance hypothesis is valid, there is no similar way of neutralizing the exogenous increase in exports. In the short run, for a given rate of interest, the exchange rate is also given. Thus, an increase in exports improves the trade balance and stimulates domestic production in a similar way to that under a system of fixed exchange rates. Of course, the increase in domestic production itself raises the domestic rate of interest such that the exchange rate has to fall, giving a negative impulse to the trade balance. Yet, provided the LM curve is not completely inelastic, this force can only partially offset the original effect.

To summarize: While, in the absence of terms-of-trade effects, the flow model implies that the domestic economy is perfectly insulated from a permanent world-wide increase in employment, the portfolio-balance model predicts a temporary increase in both the domestic level of production and rate of interest. Both models agree in predicting a fall in the exchange rate (with undershooting in the portfolio-balance model). Under the flow hypothesis there is no change in capital movements, but under the portfolio-balance hypothesis the world-wide increase in employment creates capital exports that gradually decline with the passage of time. In each stage of the adjustment process the level of capital exports moves in the same direction as the domestic rate of interest. This once again fundamentally contradicts the flow hypothesis.

V. Concluding Remarks

In the present paper the portfolio-balance approach to exchange rate determination was integrated into the Keynesian model and its implications were compared with those of the traditional flow hypothesis of capital movements. It is surprising to what extent the replacement of only one behavioral assumption alters the nature of the model. In hardly any sense can it be claimed that the capital-flow hypothesis may serve as an approximation to the portfolio-balance hypothesis.

This can be seen most clearly in the relationship between capital movements and the rate of interest under the portfolio-balance hypothesis.

Excluding the limiting case of perfect capital substitutability, there are four basic patterns of dynamic adjustment analyzed in the paper. In two of these, for every stage in the adjustment process, the relationship is *as if* the flow of net capital imports were a *falling* function of the domestic rate of interest. Moreover, even in the two other cases we achieve the same result if we consider only the adjustment process *after* the immediate reaction to the corresponding exogenous shock. These findings should serve as a powerful means of distinguishing empirically between the two rival hypotheses.

Another clear discrimination between the models is given by their implications for an international transmission of employment changes. The flow model predicts a perfect insulation (or a negative transmission due to terms-of-trade effects). In the portfolio-balance model, however, there are positive spill-over effects, a result that clearly is supported by casual empirical evidence.

The only possibility under which the difference between the two alternative formulations of the Keynesian model vanishes is the case of perfect capital substitutability. Here the Mundellian result of a total ineffectiveness of fiscal policy can be restated. However, while perfect capital mobility appears to be a realistic assumption in the light of modern communication techniques, perfect capital substitutability does not. Despite positive interest rate differentials risk-averse investors will always prefer to diversify in order to reduce the currency risk under floating exchange rates.

With perfect mobility but imperfect substitutability of capital we are in the world of the portfolio-balance approach analyzed in this paper. In this world there is no way to restate the dominance of monetary over fiscal policy. Rather, the reverse seems to apply. If a contractive monetary policy raises the rate of interest and creates capital imports as the flow hypothesis predicts, then the strength of monetary policy is in the short run rather than in the long run. The effects of fiscal policy, on the other hand, are definitely growing with the passage of time. These observations not only merit contrast with Mundell's result, but also with the frequent contention that monetary policy brings about lasting effects on the level of economic activity while those of fiscal policy vanish with the passage of time[1].

[1] In their review article on the crowding-out effect Spencer and Yohe [1972, p. 451] state: "Articles published in this Review [Federal Reserve Bank of St. Louis Review] suggest that government expenditures financed by taxes or borrowing from the public are important over a very short period, but their tendency to crowd out private expenditures obviates any significant, lasting influence".

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Zusammenfassung: Internationale Kapitalbewegungen, flexible Wechselkurse und das IS-LM-Modell: Ein Vergleich zwischen der Bestandsgrößen- und der Strömungsgrößen-Hypothese. — In diesem Artikel wird der Portfolio-Ansatz in ein dynamisches keynesianisches Modell mit flexiblen Wechselkursen integriert, und die Ergebnisse werden den Folgerungen aus der traditionellen Kapitalstrom-Hypothese gegenübergestellt. Daraus ergeben sich so erstaunliche Resultate wie die folgenden: Wenn eine monetäre Expansion Kapitalexporte bewirkt, dann ist sie langfristig weniger wirksam als kurzfristig. Mit der Fiskalpolitik ist ein bedeutender Crowding-in-Effekt verbunden. Es gibt eine gleichgerichtete Übertragung von Veränderungen der Beschäftigung eines Landes auf andere Länder. Der heimische Zinssatz und die Höhe der Netto-Kapitalexporte stehen normalerweise positiv miteinander in Beziehung.

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Résumé: Les mouvements des capitaux internationaux, les taux de change flexibles et le modèle IS-LM: Une comparaison entre modèles aux variables de stocks et de flux. — Cet article intègre l'approche du portefeuille dans un modèle

dynamique keynésien aux taux de change flexibles et confronte les résultats avec l'hypothèse traditionnelle de flux de capital. Il y a quelques résultats frappants comme par exemple les suivants. Si une expansion monétaire cause la sortie du capital elle est moins efficace à long terme qu'à court terme. La politique fiscale a un effet «crowding-in» significatif. Il y a une transmission positive des changements internationaux d'emploi. Le taux d'intérêt local et le niveau des exportations nettes de capital sont en relation positive l'un à l'autre.

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Resumen: Movimientos de capital internacionales, tasas de cambio flexibles y el modelo IS-LM: una comparación entre el balance de portafolio y la hipótesis de flujos. — El artículo integra el planteamiento de balance de portafolio a un modelo keynesiano dinámico con tasas de cambio flexibles y contrasta sus resultados con las deducciones de la hipótesis tradicional de flujos de capital. Entre sus resultados hay algunos tan controvertidos como los siguientes. Si una expansión monetaria provoca exportaciones de capital, entonces es menos efectiva en el largo plazo que en el corto plazo. La política fiscal goza de un efecto de agolpamiento hacia adentro significativo. Hay una transmisión positiva de cambios internacionales en el empleo. La tasa de interés doméstica y el nivel de exportaciones de capital netas están típicamente relacionados positivamente entre ellos.